



Sydney Environmental & Soil Laboratory

Specialists in Soil Chemistry, Agronomy
and Contamination Assessments

Mulches and Soil Improvers

Sydney Environmental & Soil Laboratory Pty Ltd ABN 70 106 810 708

PO Box 357
Pennant Hills
NSW 1715

16 Chilvers Road
Thornleigh NSW
2120 Australia

T: 02 9980 6554 E: info@sesl.com.au
F: 02 9484 2427 W: www.sesl.com.au

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Mulches and Soil Improvers.

Question:

We have a problem in a landscape largely composed of Lomandra in traffic islands and roundabouts. The plants are yellowish and failing to thrive. We have mulched with woodchip and fertilised normally and are wondering why the landscape is not looking better?

Answer:

It is quite likely that the cause is nitrogen draw down by the woody mulch product, a commonly seen problem poorly understood by landscapers.

We have all been educated to believe that mulching and improving soil organic matter is a good thing and there are few jobs where this is not done. The use of mulches and organic matter treatment of the surface soil is often beneficial but there are two problems that often occur-

1. The "some is good more is better syndrome". For decorative and physical effect mulch needs to be no deeper than 75 mm, any deeper can cause problems.
2. Failure to understand the properties of the organic material leading to a range of problems including N draw down, P toxicity in natives, excessively rich conditions, or the opposite, poor soil nutrient levels.

Our laboratory has seen many problems from use of organic matter for example a line of old Lophostemon killed by deep mulching (200mm) with fresh (not composted) leaf and wood mulch mixture which actually came off the trees during pruning. The decay of the rich wet organic matter consumed oxygen and the topsoil underneath it was anaerobic (sour) and smelled badly resulting in suffocation of the root system.

Another example would be mushroom compost specified for P sensitive heathland flora, and woody mulch products used without thought to the N draw down problem resulting in symptoms similar to those you have described. We have seen sewage sludge products produce widespread P toxicity problems in Banksia and Grevillea.

The fundamental problem is that all organic matters are different and there is no systematic way of describing them. An attempt is being made to provide a basis for such description in a new Australian Standard for Composts, mulches, and soil conditioners", currently in draft form (DR95301).

Apart from a list of requirements regarding the presence of foreign matter, pH, organic matter content, and salt content a basic division in the draft standard is whether the products claim a contribution to plant nutrition or not. This is assessed by a range of tests including N content, C/N ratio, and available N levels. For example, an uncomposted wood mulch containing 0.2% N (very low) and a C/N ratio of 150 (very high) could not claim a contribution to plant nutrition whereas a green waste compost with total N of 0.9% and a C/N ratio of 18 could. The main concern here is N draw down which occurs when microorganisms are presented with an energy source (organic carbon) but insufficient nitrogen to utilise it, and they consequently deplete soil N reserves causing starvation in the plantings.

In practice the draft standard will be a working guide to the specification of mulches and a better understanding of whether fertiliser is needed in addition to the organic matter or mulch. Table 1 may help illustrate the properties of various commonly available commercial organic matters.

Table 1. Properties of the common organic matters.

Product	Properties	Precautions
Uncomposted woody mulches wood chip sawdust pine bark	Decorative and long lasting physical mulch. Severe N draw down. No nutrient contribution. Often acidic. Pine bark less of a N draw down problem.	Apply ammonium nitrate at 500g/m ³ before or 50g/m ² after spreading. Repeat every 3-6 months as needed. Use normal fertiliser applications.
Composted woody mulches wood chip sawdust pine bark	Dark coloured but long lasting physical mulch. N draw down improved but no nutrient contribution unless fertilisers added.	Use as is but assess the need for 50g/sqm nitram after 3-6 months. Use normal fertiliser applications unless already fertilised.
Green waste uncomposted	Moderate nutrient content. Weeds and plant pathogens a problem	Do not use, all green waste should be composted to reduce the spread of weeds and pathogens.
Composted green waste	Coarse fractions similar to composted wood mulch, fine fraction usually a low nutrient contribution unless fortified with other fertilisers, manures, or other wastes eg food waste.	Coarse fractions: N draw down reduced but assess the need for 50g/sqm nitram after 3-6 months. Fine fractions used as soil improver. Additional fertiliser usually needed unless fortified.
Composted sewage products	Used as soil improver a significant nutrient level expected. No additional fertiliser usually needed.	P toxicity in P sensitive plants a risk. Excessive amounts in soil can cause anaerobic soil conditions. 20% by volume of soil more than adequate. Excess nitrate can be a problem.
Mushroom compost	Used as soil improver or mulch. Very high and imbalanced nutrient levels, very high in nitrogen, phosphorus, sulphur and calcium.	Do not use on P sensitive plants. Do not use additional fertiliser. Do not repeat apply. Ideal on heavy clays as the gypsum content helps "break" the clay.
Poultry manures	Very N rich, often also phosphorus rich, Used as soil improver no additional fertiliser usually needed.	Do not use on P sensitive plants. Do not use more than about 10% by volume in a soil. No extra fertiliser usually needed.
Other animal manures	Used as soil improver. Moderately high and well balanced nutrient levels. Do not use additional fertiliser.	Do not use excessive levels on P sensitive plants. Up to 20% by volume allowable on other plantings.

Generally, additional soil organic matter is usually not needed if the soil already contains around 5% organic matter (Craul 1992), and for many Australian native plantings 2% would be adequate. Do not apply organic matter at depths greater than 200mm, it is both unnecessary and increases the risk of anaerobic conditions in wet soil conditions.

Woody or bark materials can be used uncomposted if extra nitrogen is allowed for at planting and during maintenance. Green waste and leafy mulch should not be used uncomposted because, apart from the risk of spreading weed seeds and pathogens, rapid decay can cause anaerobiosis and fungal growth. White fungal growth can cause waterproofing in the mulch and consequent drought problems.

Various mixtures can be made to produce a "mulch and feed" product. For example a mix of wood chip and animal manure can be spread on existing plantings and worm activity relied upon to mix the organic matter into the soil.

The cure to your current problem is to apply 50g/sqm of nitram to the surface mulch, water it in and assess the result in 1 month.

Further Reading

Standards Association of Australia. DR95301 or its replacement - 1996. Draft Standard Composts, mulches, and other soil conditioners. Standards Association of Australia. Homebush NSW.

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